

BIBIKOVA, V.A.; IL'INSKAYA, V.L.; KALUZHENOVA, Z.P.; MOROZOVA, I.V.;
SHMUTER, M.F.

Biology of fleas of the genus *Xenopsylla* in Sary-Ishik-Otrau.
Zool. zhur. 42 no.7:1045-1051 '63. (MIRA 17:2)

1. Central-Asian Research Anti-Plague Institute, Alma-Ata.

BIBIKOVA, V.A.; GORBUNOVA, A.I. [deceased]; MASLENNIKOVA, Z.P.; MOROZOVA,
I.V.; SEMUTER, M.F.

Methods of studying the abundance of fleas of the greater
gerbil. Zool.zhur. 44 no.8:1214-1218 '65.

(MIRA 18:11)

1. Sredneaziatskiy nauchno-issledovatel'skiy protivochumnyy
institut, Alma-Ata.

017-30
ACC NR: AP7001165 (AN) SOURCE CODE: UR/0439/65/044/008/1214/1218

AUTHOR: Bibikova, V. A.; Gorbunova, A. I.; Maslennikova, Z. P.; Morozova, I. V.; Shmuter, M. F.--Schmuter, M. F.

ORG: Central Asian Antiplague Research Institute, Alma-Ata (Sredneaziatskiy nauchno-issledovatel'skiy protivochumnyy institut)

TITLE: Method of studying population density of fleas in *Rhombomys opimus* Licht.

SOURCE: Zooloticheskiy zhurnal, v. 44, no. 8, 1965, 1214-1218

TOPIC TAGS: flea, flea reproduction, flea migration, plague transmission, disease vector, mole

ABSTRACT: A technique for total count of fleas found in the burrows of *Rhombomys opimus* Licht. is described. The technique consists of trapping and counting the migrating parasites after the animals are removed from the burrows. Due to a relatively stable migration and the reproduction rate of fleas, three samples suffice for the total count. In practical terms, it means that all fleas present in the burrows can be trapped during the 7—45 day period after the removal of the animals. The total flea population in the burrows can be estimated on the basis of the relatively

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UDC: 595.775:599.323.4 *Rhombomys*:591.526-59.08

ACC NR: AP7001165

stable percentages obtained in sampling procedures. In view of the significant role of fleas in transmission of plague, the importance of monitoring the flea populations is stressed by the authors. Orig. art. has: 1 table. [Based on authors' abstract]

[WA-50]

SUB CODE: 06/SUBM DATE: none/ORIG REF: 006/CAR

Card 2/2

SMIRNOV, S.M.; TLEUGABYLOV, M.K.; SHMUTER, M.F.; UZBEKOVA, B.R.

Epicutaneous immunization of subjects against brucellosis with
a vaccine from Brucella abortus strain 19. Zhur.mikrobiol.epid.
i immun. 32 no.1:51-54 Ja '61. (MIRA 14:6)

1. Iz Sredneaziatskogo protivochumnogo instituta Ministerstva
zdravookhraneniya SSSR.
(BRUCELLOSIS)

BUL'KANOV, A.A.; SHMUTER, S.L.

Investigating electromechanical braking of the driving gear of
a milling machine. Stan.i instr. 33 no.12:21-24 D '62.
(MIRA 16:1)
(Milling machines--Electric driving)

SHMUTER, S.L.

Specification of the technical characteristic and selection of
rated conditions in designing longitudinal milling machines.
Stand instr. 34 no.7:7-12 J1 '63. (MIRA 16:9)
(Milling machines--Design and construction)

KUPINOV, V.A.; SHMUTEE, S.L.

Dynamic system and errors of program controlled machine tools.
Stan. 1 instr. 35 no.11:3-6 N '64. (MIPA 18:3)

SHMUTER, S.I.

Analysis of dynamic errors of program controlled milling machines.
Stan. 1 instr. 36 no.4:8-12 Ap '65. (MIRA 18:5)

SHMUTTER, A.V.

Bursitis in miners. Ortop., travm. i protez. no.6:55-59 N-D '55.
(MLRA 9:12)

1. Iz Gorskoy bel'nitsy, Voroshilovgradskoy oblasti.

(BURSITIS

etiol. & clin. aspects, in miners)

(OCCUPATIONAL DISEASES

bursitis in miners, etiol. & clin. aspects)

1. SHMUYLIN, S. Ya.: KOSHEVOY, M. A.: GUMANYUK, A.A. (and others)
2. USSR (600)
4. Karakul Sheep
7. Principles in developing and caring for the flock on state karakul farms.
Kar. i zver. 5 No. 5, 1952.

9. Monthly List of Russian Accessions, Library of Congress, January 1953, Unclassified.

SHMUYLO, S.

Equestrian competitions. Voen. znan. 25 no.4:18-19 Ap '49.
(MIRA 12:12)

(Horsemanship)

BYCHKOV, N.P., kandidat tekhnicheskikh nauk; SHMUYLOV, N.L., redaktor;
VOICHOK, K.M., tekhnicheskij redaktor

[Ships of the maintenance fleet] Suda tekhnicheskogo flota, Lenin-
grad, Gos. izd-vo vodnogo transporta, 1954. 424 p. (MLRA 9:8)
(Dredging machinery) (Excavating machinery)
(Ships)

DORMIDONTOV, Nikolay Konstantinovich, doktor tekhn. nauk, prof.;
LYSENKO, Lavr Georgiyevich, kand. tekhn. nauk; PAVLOV,
Aleksandr Ivanovich, dots., kand. tekhn. nauk; TEREENT'YEV,
Georgiy Borisovich, kand. tekhn. nauk; SHMUYLOV, Nikolay
Leonidovich, st. prepod. inzh.; Primal uchastiye KUZNETSOV, V.P.,
kand. tekhn. nauk, dots.; SMOLYAKOV, B.N., dots., retsenzent; GRINBAUM, A.F.,
inzh. retsenzent; VARENOV, P.G., inzh., retsenzent; ASHIK, V.V., red.; VOLCHOK,
K.M., tekhn. red.

[Design and arrangement of ships for inland navigation] Kon-
struktsiia i ustroistvo sudov vnutrennego plavaniia. Pod ob-
shchei red. N.K. Dormidontova. Leningrad, Izd-vo "Rechnoi
transport," Pt.2. [Metal ships] Metallicheskie suda. 1962.
271 p. (MIRA 15:12)

1. Kafedra arkhitektury i proyektirovaniya korablya Lenin-
gradskogo instituta vodnogo transporta (for Dormidontov,
Lysenko, Pavlov, Terent'yev, Shmuylov, Kuznetsov).

(Naval architecture)
(Ships, Iron and steel)

AKOL'ZIN, P.A., doktor tekhn.nauk; DANILENKO, D.A., kand, tekhn.nauk;
KOLODEZNYI, B.A., inzh.; KULAKOV, M.A., inzh.; SHMUYLOVICH, I.Kh.,
inzh.

Prevention of hydrogen corrosion by means of hydrazine.
Teploenergetika 4 no.11:95 N '57. (MIRA 10:10)
(Feed-water purification)

SHMUYLOVICH, I. Kh.

Distr: 4E1j/4E3d
 ✓ Water softening. I. Causes of hardness and reasons for reduction. George E. Symons (Scranton Publishing Co., Pontiac, Ill.). *Water & Sewage Works* 104, 397-400 (1957). Prevention of oxygen corrosion by aid of hydrazine. P. A. Akol'zin, D. A. Danilenko, B. A. Kolodernyi, M. A. Kulikov, and I. Kh. Shmuylovich. *Teploenergetika* 4, No. 11, 90 (1957).—The removal of O from boiler H₂O, condensates, and similar H₂O which reaches sometimes during its use a higher temp. is brought about according to the reaction $N_2H_4 \cdot H_2O(l) + O_2 = N_2 + 3 H_2O$. As the amt. of O is subject to heavy fluctuations, an excess of I be must applied, which does not matter under the conditions encountered, as on exposure to temps. of 104° the reaction $3 N_2H_4 = 4 NH_3 + N_2$ will proceed rapidly, and the NH₃ liberated does not cause any damage in the H₂O or for its intended use.
 Werner Jacobson

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SHMUYLOVICH, I.Kh., inzh.

Selection of a method of water treatment for power plants. Teplo-energetika 4 no.12:52-54 D '57. (MIRA 10:11)

1. Lesenergo.

(Feed-water purification)

BUKACHUK, Yu.M.: 1974-1975, I.R.

Central control system of the Krasnaya Hydroelectric Power
Station. Trudy Leningradskogo nauchno-issledovatel'skogo
instituta elektromekhaniki, 1974, no. 1, p. 1-10.

(MIRA 18:10)

GROMOVA, V.V., inzh.; SHMUYLOVICH, L. Ya., inzh.

Tables of specific power ratings for light fixtures with
incandescent lamps. Svetotekhnika 7 no.4:18-26 Ap '61.

(MIRA 14:6)

1. LO Gosudarstvennogo proyektnogo instituta "Tyazhpromelektropeyekt."
(Electric light fixtures--Tables, calculations, etc.)

ORECHKIN, D.B.; POPOVA, N.V.; FEDOROV, A.P.; SHEPOT'KO, O.F.; SHMUYLOVICH,
M.M.

Oxidation of paraffins in pilot plant units. Khim.i tekhn.topl.i
masel 5 no.7:16-18 J1 '60. (MIRA 13:7)
(Paraffins) (Oxidation)

ROZENTSVIT, A.I., kandidat meditsinskikh nauk; SHKODINA, A.I.; SHMUYLOVICH, T.N.

Industrial accidents at the Odessa Ship Repair Yards. Ortop.travm. i
protez. 17 no.6:128-129 N-D '56. (MLRA 10:2)

1. Iz kliniki ortopedii (zaveduyushchiy - professor M.L.Dmitriyev)
Odesskogo meditsinskogo instituta im. N.I.Pirogova (direktor -
professor I.Ya. Deynaka) i polikliniki No.2 (zaveduyushchiy - Ya.S.
Sotnik) Chernomorvodadravotdela.
(ODESSA--SHIPS--MAINTENANCE AND REPAIR)
(INDUSTRIAL ACCIDENTS)

EPSHTEYN, R.B.; FARBER, E.L.; GUTENEVA, L.Z.; SHMUYLOVICH, D.S.

Vanillin from sulfate liquors. Bum.prom. 37 no.1:20 Ja '62.
(MIRA 15:1)

1. Ukrainskiy nauchno-issledovatel'skiy institut pishchevoy
promyshlennosti.

(Woodpulp)
(Vanillin)

GIL'BO, M. P., SHNUYLOVICH, Ya. M.,

Brain - Diseases

Two cases of salvarsan encephalopathy; cure. Vest. ven. i derm. no. 2, March-April
1952

Monthly List of Russian Accessions, Library of Congress, August 1952. UNCLASSIFIED.

Shmuylovich, Ya.M.

BERMAN, N.A., kand.med.nauk; KARLIN, M.I., kand.med.nauk; SHMUYLOVICH, Ya.M.
vrach.

Toxiderma during treatment with sinestrol. Vest.derm. i ven. 32
no.1:77-78 Ja-F '58. (MIRA 11:4)

1. Iz Kozhno-venerologicheskogo dispansera No.3, Leningrad.
(SKIN--DISEASES) (ESTROGENS)

ACC NR: AP6034949

(N)

SOURCE CODE: UR/0146/66/009/005/0116/0120

AUTHOR: Shmuylovich, Ye. G.

ORG: Leningrad Institute for Aviation Instrument Construction (Leningradskiy institut aviatsionnogo priborostroyeniya)

TITLE: A method for reducing the reaction of a gyroscopic compass to random perturbations

SOURCE: IVUZ. Priborostroyeniye, v. 9, no. 5, 1966, 116-120

TOPIC TAGS: gyrocompass, metal friction, error minimization, ship navigation

ABSTRACT: The article reports the results of an investigation of the effects of parameters of different types of rotation on the value of the error of a gyrocompass in supports with dry friction, under conditions of the irregular rocking of a ship. If the horizontal suspension of the gyroscope is placed in the diametral plane of the ship, the error, α , of a gyroscopic compass, due to the presence of dry friction in the axis of the compass ring, can be determined by the equation

$$H \dot{\alpha}(t) = M_T + k \operatorname{sign}[\dot{\Theta}(t) + \dot{\beta}(t)]. \quad (1)$$

where $\Theta(t)$ is the heeling angle of the ship, which is a stationary random function of time; H , M_T , and k constants; $\dot{\beta}(t)$, is the absolute rate of motion of the gyroscope

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UDC: 62-752.4

ACC NR: AP6034949

with respect to the inner axis. It is shown mathematically in the article that the use of a support capable of different types of rotation can reduce the friction in the support and permit a substantial decrease in the error of the gyroscope under conditions of irregular perturbations. Orig. art. has: 11 formulas.

SUB CODE: 13 17/ SUBM DATE: 16Apr66/ ORIG REF: 004

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SHMUYLOVICH, Yu., inzh. (Omsk)

Utilizing the heat of motorcycle engines for vulcanization
of tire tubes. Za rul. 16 no.10:13 0 '58. (MIRA 12:1)
(Vulcanization)

SHMYAKOV, A.M.

Feeding of sodium silicate by pneumatic tubes. Lit. priozv. no.1:
36-37 Ja '61. (MIRA 14:1)
(Sodium silicate) (Pneumatic-tube transportation)

SHMYAKOV, A.M.

Automatic mold pouring. Lit. proizv. no.5:18-19 My '62.(MIRA 16:3)
(Founding) (Automation)

SHMYAKOV, A.M.

Automatic positioning of the cores in foundry molds. Lit. proizv.
no.8:21 Ag '62. (MIRA 15:11)

(Founding)

SHMYAKOV, A.M.

Multiple disk semi-slinger head. Lit. proizv. no.2:12 F '63.
(MIRA 16:3)

(Foundries—Equipment and supplies)

CHMYGAIEV, V.I., CHMYGALINA, M.M., KOPSAKOV, M.A.

Morphology of the "Fedorov tundra" intrusion. Mat. po geol.
i pol. iskop. Sev.-Zap. RSFSR no.3:139-142 '62.

(MIRA 1962)

SHMYGALIEV, V.I.; SHMYGALIEVA, Kh.M.; KORGACHEVA, M.A.

Morphology of the "Fedorov tundra" intrusion. Mat. geol.
i pol. iskop. Sev.-Zap. RSFSR no.3:139-142 '62.

(MIRA 17:12)

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L 35073-65 EPP(c)/EPR/EWP(j)/EWT(m)/T Pc-4/Pr-4/Ps-4 RPL RM/WW

ACCESSION NR: AR5006368

S/0081/64/000/024/S031/S032

SOURCE: Ref. zh. Khimiya, Abs. 24S182

42
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B+1

AUTHOR: Mikhant'yev, B. I.; Sklyarov, V. A.; Fedorov, Ye. I.; Avtonomova, M. D.; Shmygaleva, T. A.; V'yukova, V. P.; Shatsman, F. D.; Shevtsova, A. G.; Afanasov, I. P.

TITLE: Polymerization and copolymerization of simple vinyl ethers

CITED SOURCE: Tr. Labor. khimii vysokomolekul. soyedineniy. Voronezhsk. un-t, vyp. 2, 1963, 3-11

TOPIC TAGS: polymerization, copolymerization, vinyl ether, polymer, copolymer

TRANSLATION: The possibility of producing high-molecular polymers and copolymers of vinylbutyl ester was investigated. In the presence of ferric chloride at 50-70 mm pressure and 80-90°C vinylbutyl ester is polymerized to form a product with a molecular weight of 14,000. A polymer with a molecular weight of 6,400 is obtained at normal pressure and -3°C in the presence of BF₃. Vinylbutyl ester is copolymerized with divinyl in the presence of BF₃ or ferric chloride; BF₃ appears to be the better catalyst, in whose presence a polymer with the molecular weight of

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L 35073-65

ACCESSION NR: AR5006368

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10,400 is produced at -5°C . Chains of vinylbutyl ester predominate in the structure of the copolymer, and transverse bonds are present on account of the divinyl chains. The copolymerization of vinylbutyl ester with divinyl does not occur under the effect of phosphorus anhydride and ferric chloride. The polyvinylethyl ester is copolymerized with styrene (1:1) in the presence of ferric chloride and in the ratio of 1:2 in the presence of the dinitrile of azoisobutyric acid. The copolymers produced have a molecular weight of 58,000-76,000 and form films resistant to water and dilute solutions of acids and bases. Vinylbutyl ester is copolymerized with styrene in a 1:1 ratio (FeCl_3 as catalyst) and 1:8 ratio (BF_3 as catalyst); products with molecular weight of 21,000-50,000 are formed. The vinylphenyl ether is also copolymerized with styrene in ratios of 1:1 and 2:1 in the presence of the ester of BF_3 (as catalyst), and is also copolymerized with heating in ratios of 1:1, 1:2, and 2:1 at $100-105^{\circ}\text{C}$. Solid copolymers are obtained with molecular weights of 48,500-92,000. Copolymers of N-vinylacridone and styrene are produced in mass and in emulsion; N-vinylacridone, styrene, and divinyl are produced in emulsion and also N-vinylacridone, styrene, divinyl and acrylonitrile. The products have molecular weights of 200,000-650,000. Of the rubber-like materials most plastic was the latter copolymer, containing N-vinylacridone, styrene, divinyl, and acrylonitrile in the ratio 1:16:29:22. N-vinylacridone reduces the solubility and increases the hardness of the copolymers. S. Bass

Card 2/3

KISELEV, P., dispatcher; AFONSKIY, P.; GORBANEV, V.; SHMYGANOVSKIY, V.
(g. Odessa); IONESKU, Ion (Rumynskaya Narodnaya Respublika)

The fraternal international relations are growing stronger.
Sov. profsoiuzy 17 no.21:32-33 N '61. (MIRA 14:10)

1. Makeyevskiy koksokhimicheskiy zavod (for Kiselev). 2. Predsedatel' Khar'kovskogo oblastnogo komiteta profsoyuza rabochikh mashinostroyeniya (for Afonskiy). 3. Redaktor zavodskoy gazety "Za tekhnicheskiy progress" Orlovskogo zavoda imeni Medvedeva, g. Orel (for Gorbanev).

(Trade unions)

SHMYGANOVSKI, Vl. (g.Odessa)

A seaman came ashore....Sov. profsoiuzy 17 no.23:41-42 D '61.
(MIRA 14:12)

(Odessa—Community centers)
(Seamen)

AFANAS'YEV, Ya. (g.L'vov); TKACH, M., instruktor; KACHAN, L.;
SIMYGANOVSKIY, V.; VOLKOV, A.; FRID, L. (g.Minsk); PODLUZHNYI, A.
(g.Kiyev); YEVSTYUGIN, N.

Letters and correspondence. Sov. profsoiuzy 17 no.24:42-43 D '61.
(MIRA 14:12)

1. Krivorozhskiy gorodskoy komitet Kommunisticheskoy partii
Ukrainy (for Tkach). 2. Nestatnyy korrespondent zhurnala
"Sovetskiye profsoyuzy" g. Vitebsk (for Kachan). 3. Predsedatel'
rabochego komiteta sovkhoza "Cherevkovskiy" Krasnoborskogo rayona,
Arkhangel'skoy obl. (for Volkov). 4. Neshtatnyy korrespondent
zhurnala "Sovetskiye profsoyuzy", Sverdlovskaya obl. (for
Yevstyugin).

(Community centers)
(Evening and continuation schools)

NEKAYEV, P. (st. Shakhun'ya, Gor'kovskoy zheleznoy dorogi); BUROV, V.
(g.Kyzyl); SILIN, I., neshtatnyy instruktor; BOROD'KO, I.
(g.Vorkuta); NAZAROV, N. (g.Ural'sk); MOSHKOV, P.;
SHMYGANOVSKIY, V.

People talk, advise and criticize. Sov. profsoiuzy 18 no.4:
26-27 F '62. (MIRA 15:3)

1. Belgo...skiy oblastnoy sovet profsoyuzov po Koro-chanskomu rayonu (for Silin).
 2. Neshtatnyy korrespondent zhurnala "Sovetskiye profsoyuzy" (for Borod'ko, Shmyganovskiy).
 3. Predsedatel' soveta fotokluba Vologodskogo Dvortsa kul'tury zheleznodorozhnikov (for Moshkov).
- (Trade unions)

APPENDIX I.

1,200,000 Kilometers with Major Overhaul, Published by "Sovetskaya
Kolyma", Moscow, 1958.

SHMYGIN, I. I., (Postgraduate Student, All-Union Institute of Animal Husbandry)

The effect of terramycin and grisyn on blood factors in calves

Veterinariya vol. 38, no. 10, October 1961, pp 78

SHMYGIN, I.I., aspirant

Effect of terramycin and grisein on some blood indices in
calves. Veterinariia 38 no.10:78-80 0 '61. (MIRA 16:2)

1. Vsesoyuznyy institut zhivotnovodstva.
(Grisein) (Terramycin) (Veterinary hematology)

SHMYGIN, I.I., kand. biolog. nauk

Fertilizability of cows after the application of pregnant
mare's serum. Veterinariia 41 no.11:76-78 N '64.

(MIRA 18:11)

1. Vsesoyuznyy institut zhivotnovodstva.

SHMYGLEVSKIY, I., inzh.

Double-grid tubes. IUn.tekh. 3 no.4:53 Ap '59.

(MIRA 12:4)

(Electron tubes)

SHMYGLEVSKIY, N. A., Cand Tech Sci -- "Increase^d of ~~the~~ effective use of grain-harvesting combines on ~~inclines~~ ^{slopes through} ~~at the~~ ^{ation} ~~expense of~~ automatic stabilizers of the thresher in horizontal position." Ordzhonikidze, 1961. (Min of Agr^y Uk^rSSR. Ukrainian Acad of Agr^y Sci) (KL, 8-61, 252)

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SHMYG [illegible] [illegible] rich, st. prepodavatel'; BEDRAK,

[operation of hydraulic systems of agricultural machinery]
Raspolozheniya i sistem sel'skokhoziaistvennykh mashin.
[illegible] [illegible] knizhnoe izd-vo, 1961.
(MIRA 18:4)

SHMYGLEVSKIY, Nikolay Aleksandrovich; BEDRAK, T.V., red.

[Operating the hydraulic systems of tractors] Ekspluatatsiia gidrosistem traktorov. Ordzhonikidze, Severo-Osetinskoe knizhnoe izd-vo, 1960. 74 p. (MIRA 18:3)

CHERNYKH, YU. D., CHURCHIN, P. T. and KATSOVA, O. N.

"Certain Problems of Gas Dynamics" a paper presented at the Conference on Methods of Development of Soviet Mathematical Machine-Building and Instrument-Building, 12-17 March 1956.

Translation No. 590, 8 Oct 56

SHMYGLEVSKIY, Yu. D. Cand Phys-Math Sci -- (diss) "Variational problem of the gas dynamics of axially-symmetric^l supersonic currents." Mos, 1957. Cover, 4 pp 20 cm. (Acad Sci USSR. Math Inst im V. A. Steklov), 110 copies (KL, 24-57, 115)

SHYGLITSKIY, Yu. D.

"Calculation of axis-symmetrical supersonic gas flows in the neighbourhood of a break in the generatrix of solids of revolution."

Two methods have been developed for calculating axis-symmetrical supersonic gas flows in the neighbourhood of a break of the generatrix of solids of revolution. The investigated flows are three-dimensional ones which are analogous to the flow of Mayer. Solution of the gas dynamics equations are found in the form of power series, the first coefficients of which represent the flows of Mayer, whilst the subsequent ones are corrections taking into account the axial symmetry of the flow. The first described method permits determining the magnitude of the speed components in any point of the zone of the bend where the angle changes. The second method gives the magnitude of the angle of perturbations, the inclination angle of the speed and the coordinates directly for any characteristic of the zone of bending where the angle changes. These values are necessary for calculating the zone located beyond the zone under consideration. (First published 1950).

Symposium of Theoretical Work on Aerodynamics, Oborongiz, 1957, 3,000 copies, Central Aero-Hydrodynamics Inst. imeni Prof. N. Ye. Zhudovskiy.

SHMYG-LEVSKIY. Yu-D

PHASE I BOOK EXPLOITATION

823

Tsentrall'nyy aero-gidrodinamicheskii institut

Sbornik teoreticheskikh rabot po aerodinamike (Collection of
Theoretical Papers in Aerodynamics) Moscow, Oborongiz, 1957.
509 p. 3,000 copies printed.

Ed.: Ushakov, B.A.

PURPOSE: This collection assembles a number of scientific reports,
on theoretical aerodynamics, first printed in various publications
between 1947 and 1952, and intended for research workers in ad-
vanced aerodynamics.

COVERAGE: The collection contains 26 papers on theoretical aero-
dynamics, published by the Tsentrall'nyy Aero-gidrodinamicheskii
Institut imeni Professora N.Ye. Zhukovskogo (Central Aero-hydro-
dynamic Institute imeni Professor N.Ye. Zhukovskiy), first

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Collection of Theoretical Papers (Cont.) 823

printed for limited distribution in various publications during the period 1947 to 1952. These papers were of course completed a considerable time prior to the date of publication. The papers presented in this collection may be divided into several groups. The reports of the first group deal with methods of solution of two-dimensional subsonic problems for the case of adiabatic gas flow (A.A. Nikol'skiy, B.M. Kiselev) and present several exact solutions of the equation of three-dimensional gas flows (A.A. Nikol'skiy). The reports of the second group are concerned with the study of supersonic gas flow around bodies of revolution. Ducted bodies having minimum drag are considered (A.A. Nikol'skiy); the relationship between the shock-wave curvature and the surface of the ducted body is studied (A.A. Dorodnitsyn). The characteristics of supersonic flow near sharp trailing edges are described (A.A. Nikol'skiy), a general analysis of several cases of axially symmetrical flows is made (A.A. Dorodnitsyn), and a specific calculation in the neighborhood of the break in the

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Collection of Theoretical Papers (Cont.) 823

generatrix of the body of revolution is given (Yu.D. Shmyglevskiy). The third group includes a report by A.A. Dorodnitsyn on a method of calculating the pressure distribution on bodies of revolution at zero angle of attack and an extension of this report, the paper by V.V. Sychev on bodies of revolution at an angle of attack. The papers in the fourth group include reports on the boundary layer and heat transfer. The investigations of A.A. Dorodnitsyn on the theory of a laminar boundary layer in a compressible gas and the investigations of V.V. Struminskiy on the theory of the three-dimensional boundary layer on a slipping wing are presented. The reports of I.N. Sokolova concern problems of temperature of a plate and of a cone, taking radiation into account. This group also includes the investigations of V.V. Struminskiy on the theory of the unsteady boundary layer. The reports of the fifth group deal with problems concerning wing theory; methods of calculating the circulation around a sweptback wing in subsonic flow (V.V. Struminskiy and N.K. Lebed') and along wings of small aspect ratio (P.I. Chushkin and G.A. Kolesnikov) are presented, as are also

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Collection of Theoretical Papers (Cont.) 823

papers on supersonic flow around cruciform wings and ailerons (V.M. Shurygin). In the reports of the sixth group general problems are treated which are associated with the theory of compressors (L.A. Simonov); supersonic flow around a cascade is considered by V.V. Keldysh, and the total-pressure losses in the pressure discontinuities ahead of the cascade are discussed by G.I. Tiganov.

TABLE OF CONTENTS:

Foreword

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Nikol'skiy, A.A. Variational Equations of Two-dimensional
Adiabatic Gas Flows

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The report, first published in 1948, gives a method of investigating two-dimensional adiabatic gas flows in the vicinity of given flows. The variational equations of motion of a gas in the flow plane and the subsequent transformation to the

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Collection of Theoretical Papers (Cont.) 823

variables of the hodograph plane permits reducing the problem to the investigation of the solutions of the linear partial differential equation of the second order common for all cases under simple boundary conditions. The report is divided into the following sections: 1. Derivation of equations; 2. Boundary-value problems. The report contains 4 figures. There are 2 Soviet references.

Kiselev, B.M. Two-dimensional Subsonic Gas Flow Around Bodies of a Given Form 11

The report, first published in 1952, gives a method for calculating the two-dimensional subsonic gas flow around bodies of a given form. A first approximation may be used with a high degree of accuracy. The report is divided into the following sections: Introduction; 1. Mass-flow functions; 2. Mass-flow functions in a complex form, a generalization of Chaplygin's formula; 3. Canonical form of equations of motion;

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Collection of Theoretical Papers (Cont.) 823

4. Approximate method of solution of the equations; 5. Flow around a circular cylinder; 6. Flow around a profile of arbitrary form; 7. Another method of constructing the solution. The report contains 10 figures and 3 tables. There are 5 references, of which 4 are Soviet and 1 German.

Nikol'skiy, A.A. Several Exact Solutions of Equations of Three-dimensional Gas Flows 27

This report was first published in 1949. A class of three-dimensional supersonic adiabatic gas flows is found, each of which is represented by a curve in the velocity-hodograph space. These flows are a generalization for the case of the space of known Prandtl-Mayer flows, and each of them may be considered as the result of an undisturbed flow around a solid wall, representing the developed surface. The results of this paper may be applied to calculations of wings of finite span in supersonic gas flow. The report is divided into

Card 6/33

Collection of Theoretical Papers (Cont.) 823

the following sections: 1. Flow characteristics; 2. Flow around a solid wall. The report contains 7 figures. There are no references.

Nikol'skiy, A.A. Generalization of Riemann Waves to Include Three-dimensional Case 34

This report was first published in 1949. Various three-dimensional adiabatic unsteady gas motions are sought in which surfaces of constant pressure are simultaneously surfaces of constant velocity vector. These surfaces are found to be planes which remain parallel and move with constant velocity. Special cases of the motions considered are one-dimensional unsteady Riemann flows (Riemann waves), two-dimensional supersonic Prandtl-Mayer flows (which are steady flows), and three-dimensional steady gas flows, the form of which degenerates into a line in the velocity-hodograph space. The report contains 2 figures. There is 1 Soviet reference.

Card 7/33

Collection of Theoretical Papers (Cont.) 823

Nikol'skiy, A.A. Conical Axially Symmetrical Supersonic Rarefaction Gas Flows

43

This report was first published in 1949. A class of axially symmetrical conical gas flows is found in which an undisturbed translational supersonic flow, starting from a certain Mach cone with its apex on the axis of symmetry, is continually rarefied. Each of these flows may be regarded as the result of an undisturbed supersonic flow around a certain body of revolution representing a semi-infinite cylinder which, starting from a certain cross section, gradually contracts. To any Mach number (larger than one) of the approach flow there corresponds an infinite single-parameter family of such flows. The results of this report may be useful in the design of the rear parts of bodies of revolution intended for flight at supersonic velocities (of fuselages, missiles, jet engines, etc.) The report contains an Appendix and 15 figures. There is 1 German reference.

Card 9/33

Collection of Theoretical Papers (Cont.) 823

Nikol'skiy, A.A. Ducted Bodies of Revolution Having Minimum External Wave Drag in Supersonic Flow 56

This report was first published in 1950. Within the framework of the linear theory, the problem of finding the shape of ducted bodies of revolution having minimum external drag has been solved. Simple explicit formulae are obtained for the drag of bodies having minimum drag. It is shown that within the range of body parameters of interest from the practical viewpoint, a change in the shape of the body does not lead to a significant change in drag if two initial sections of the body remain constant, and that therefore the formula obtained for drag may be taken as an approximation for a general drag law. All investigations were carried out for the calculated regime of passage of a stream through a duct, that is, for the case where internal processes do not affect the external flow around the body. The report is divided into the following sections: 1. Statement of problem; 2. Derivation of basic relationships; 3. Case where two sections

Card 10/33

Collection of Theoretical Papers (Cont.) 823

of the outer surface of a body and the distances between them are given; 4. Some properties of ducted bodies of revolution having minimum drag. The report contains 5 figures. There is 1 Soviet reference.

Dorodnitsyn, A.A. Dependence of the Curvature of the Compression Shock Line on the Outer Surface Curvature of a Ducted Body of Revolution

64

This report was first published in 1949. The relations are derived between the curvature of the line of a compression shock and the curvature of a meridional cross section of a ducted body of revolution. The relationship found permits construction of the element of the line of the compression shock near the leading edge, which is necessary for calculating pressure distribution of the outer surface of the body of revolution. The report contains 2 figures. There is 1 Soviet reference.

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Collection of Theoretical Papers (Cont.) 823

Nikol'skiy, A.A. Gas Flows Near Sharp Trailing Edges of Bodies of Revolution

74

This report was first published in 1949. Gas flows in the vicinity of sharp trailing edges of bodies of revolution are investigated. It is demonstrated that, if the solid angle formed by the body surface on the trailing edge is not equal to zero, there always exists a certain region near the trailing edge in which the velocity is subsonic. This applies, in particular, to cases of gas flows around bodies of revolution at supercritical Mach numbers of the approach flow (a flow with a local supersonic zone) and at approach-flow Mach numbers larger than one. The report contains 4 figures. There is 1 Soviet reference.

Dorodnitsyn, A.A. Some Cases of Axially Symmetrical Supersonic Gas Flows

77

This report was first published in 1950. Derivation of the canonical system of equations for axially symmetrical supersonic gas flows is given and methods of solving this system are presented.

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Collection of Theoretical Papers (Cont.) 823

As an example, the author analyzes the case of a flow in the vicinity of a break in the generatrix of a body of revolution which is a generalization of the known plane-parallel flow around a corner. The report is divided into the following sections: 1. Equations of axially symmetrical flows in terms of characteristic variables; 2. Solution of system when initial values on two characteristics are given; 3. Other applications of equations in terms of characteristic variables; 4. Equilibrium flow around a corner. The report contains 7 figures. There are 2 references, of which 1 is Soviet and 1 English.

Shmyglevskiy, Yu.D. Calculation of Axially Symmetrical Supersonic Gas Flows in the Vicinity of a Break in the Generatrix of a Body of Revolution

89

In this report, first published in 1950, two methods are developed for calculating axially symmetrical supersonic gas flows in the vicinity of a break in the generatrix of a body of revolution. The flows considered are three-dimen-

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Collection of Theoretical Papers (Cont.) 823

sional flows, analogous to Mayer's flow. The solutions of the gas-dynamic equations are found in the form of power series, the first coefficients of which represent Mayer's flow while the subsequent ones are corrections for the axial symmetry of the flow. The first calculation method permits determination of the magnitudes of the velocity components at any point of the angle zone. The second method gives the magnitudes of the angle of perturbations, of the angle of inclination of velocity and of the coordinates directly on any characteristic of the angle zone. These quantities are necessary for calculation of the zone located beyond the zone considered. The report is divided into the following sections: Introduction; 1. Flow in the zone around a break in the generatrix; 2. Calculation of flow in the zone around the break in the generatrix in terms of characteristic coordinates; **Appendix**. The report contains 9 figures and 24 tables. There are no references.

Card 14/33

SHMYGLEVSKIY, YU.D.

2
1-4E4
✓ NEKOTORYE VARIATSIONNYE ZADACHI GA-
ZOVOI DINAMIKI OSESIMMETRICHNYKH SVERKH-
ZVUKHOVYKH TECHENII. Yu. D. Shmyglevskii.
Prikl. Mat. i Mekh., Mar.-Apr., 1957, pp. 195-
206. In Russian. Study of variational problems of
gasdynamics of axisymmetric supersonic flows. 1.
The study includes determination of a body of least
wave drag and derivation of appropriate equations.

53
MT

124-58-9-9624

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 9, p 23 (USSR)

AUTHORS: Katskova, O. N., Shmyglevskiy, Yu. D.

TITLE: Axisymmetric Supersonic Flow of a Freely Expanding Gas With a Plane Transition Surface (Tables) [Osesimmetrichnoye sverkhzvukovoye techeniye svobodno rasshiryayushchegosya gaza s ploskoy perekhodnoy poverkhnost'yu (tablitsy)]

PERIODICAL: Vychisl. matematika, Nr 2, 1957, pp 45-89

ABSTRACT: Calculation of an axisymmetric supersonic irrotational flow of a freely expanding gas with a plane transitional (sonic) surface. The problem is examined in the coordinates z, χ , where z is constant along the streamlines and χ is constant along the characteristics of the second family. In the vicinity of the transition surface the solution is sought in the form of series according to powers of χ . A system of three ordinary differential equations is obtained for the coefficients of these series. The system is reduced to a third-order equation, the solution of which is tabulated. The remainder of the flow is constructed according to the method of characteristics.

Card 1/2 Tables are given for the parameters of the flow; the tables

124-58-9-9624

Axisymmetric Supersonic Flow of a Freely Expanding Gas (cont.)

are computed for four values of the ratio of the specific heats γ ($\gamma = 1.14000, 1.33000, 1.40000, \text{ and } 1.66667$). The tables contain the values of the Mach angle, the angles of inclination of the velocities, the cartesian coordinates and the pressure integrals at the points of intersection of the streamlines and the characteristics of the second family. The tables can be used for the construction of axisymmetric nozzles for jet propulsors cut off at the critical section.

P. P. Koryakov

1. Gas flow--Mathematical analysis
2. Supersonic flow--Mathematical analysis
3. Differential equations--Applications

Card 2/2

SOV/124-59-10-11477

Translation from: Referativnyy zhurnal, Mekhanika, 1959, No. 10, p. 60 (USSR)

AUTHOR: Shmyglevskiy, Yu. D.

TITLE: The Calculation of Axisymmetric Supersonic Gas Flow¹ in the Vicinity of a Salient Point in the Generatrix of a Body of Revolution

PERIODICAL: Sb. teor. rabot po aerodinamike. Moscow, Oborongiz, 1957, pp. 89-115

TEXT: A method is given for calculating axisymmetric supersonic potential gas flows in the vicinity of a salient point of the rotation body generatrix. The discussed three-dimensional flows are analogous to the Prandtl-Mayer flow. Each required ϕ -function dependent on certain variables ξ, η is represented as a power series:

$$\phi(\xi, \eta) = \phi_0 + \phi_1(\xi)\eta + \phi_2(\xi)\eta^2 + \dots$$

The coefficients ϕ_n of such series can be determined gradually from the recurrent system of the ordinary differential equations. Two variants of the calculation method are presented: 1) the polar coordinates ω, r are substituted for the variables ξ, η respectively; the system pole is the salient point. 2) the variables ξ, η represent characteristic coordinates; ξ is constant along the

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B

Card 1/2

SOV/124-59-10-11477

The Calculation of Axisymmetric Supersonic Gas Flow in the Vicinity of a Salient Point in the Generatrix of a Body of Revolution

characteristics starting from the salient point, and η is constant along the characteristics of the other family. The zero coefficients of the series correspond to the Prandtl-Mayer flow, but the following coefficients are axisymmetrical corrections. In both variants of the calculation method the formulations are obtained in quadratures for the first and second series coefficients. The arbitrary constants in these formulae are determined from the known course along the first characteristic of the bundle starting from the salient point. For instance, two special cases are discussed: a) flow around a rotation body having a conic nose section and a salient point in the generatrix, b) flow around a semi-infinite circular cylinder having a salient point in the generatrix in its tail section. Detailed tables were computed for a series of Mach-number values of the incident flow and also angles of the nose section, for plotting the flow in the zone enveloping the solid angle.

P. I. Chushkin

Card 2/2

✓B

1. 100-1-10014 10014

AUTHOR: Shmygl'skiy, Yu.D. (Moscow) 40-21-2-7/22

TITLE: Some Variation Problems of the Gas Dynamics of Axialsymmetric Supersonic Flows (Nekotoryye variatsionnyye zadachi gazovoy dinamiki osesimmetrichnykh sverkhzvukovykh techeniy)

PERIODICAL: Prikladnaya Matematika i Mekhanika, 1957, Vol 21, Nr 2, pp 195-206 (USSR)

ABSTRACT: The author considers two problems: 1. For an axialsymmetric flow around a body of revolution let be known a characteristic of one of the real families of characteristics. The generating line of the body which causes the smallest wave resistance has to be determined. 2. Determination of the best form of supersonic exhaust nozzles. A detailed solution is given only for the first problem. The author uses the control surface (see Nikol'skiy [Ref 1]) and reduces the problem to a degenerated variation problem which then is treated in detail. There are 6 references, 5 of which are Soviet, and 1 German.

SUBMITTED: November 12, 1956

AVAILABLE: Library of Congress

Card 1/1

1. Bodies of revolution—Supersonic flow 2. Nozzles—Determination
3. Gas dynamics

CHERNOZHUKHIN, M. P.

"Variation Problem of the Gas Dynamics of Axially-Symmetric Supersonic Flows."

dissertation defended for the degree of Cand. of Phys-Math Sci. at the Inst. of
Math. Im V. A. Steklov,

Defense of Dissertations (Jan-Jul 1957)

Section of Physical Math. Sci.

Vest. AN SSSR, v. 27, No. 12, 1957, pp. 108-9

AUTHOR: SHMYGLEVSKIY, Yu. D. PA - 3131
TITLE: A Variation Problem of the Gas Dynamics of the Axially-Symmetric
Supersonic Flows.
(Variatsionnaya zadacha gazodinamiki osesimmetrichnykh sverkhzvukovykh techeniy. Russian).
PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 3, pp 520 - 522
(U.S.S.R.)
Received: 6 / 1957 Reviewed: 7 / 1957
ABSTRACT: The present paper is supposed to determine the shape of a body of rotation with the lowest wave resistance in a supersonic flow and the shape of a nozzle with the lowest losses. A diagram shows the generatrix of the rotation body, the assumed characteristic of the first family, and the required characteristic of the second family. By means of the method by A.A. Nikol'skiy, the problem investigated here can be formulated for the functions on the assumed characteristic of the first family.
At first the denotations used here are explained. The variation problem resulting in the vortex-free case is exactly given and the corresponding equations are written down explicitly. This problem is degenerated, because the derivations of the functions are contained linearly; it may be solved by means of the method by D.E. Okhotsimskiy, Prikl. mat. i mekh., Vol 10, p 251 (1946). The solution furnishes the following results:

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9(6)

SOV/112-59-2-3461

Translation from: Referativnyy zhurnal. Elektrotehnika, 1959, Nr 2, p 175 (USSR)

AUTHOR: Shmyglevskiy, Yu. D.

TITLE: Use of Electron Computers for Engineering Calculations
(Primeneniye elektronnykh vychislitel'nykh mashin dlya inzhenernykh raschetov)

PERIODICAL: V sb.: Mekhaniz. ucheta i vychisl. rabot M.-L., Mashgiz, 1958,
pp 19-26

ABSTRACT: Structural principles of digital computers are briefly discussed, using the BESM computer as an example. Five examples of engineering calculations performed on the BESM computer are cited: (1) solution of problems of the theory of maximum equilibrium of soils by the method of characteristics; (2) calculating supersonic streams; (3) stability of long-distance electric transmission lines with an intermediate synchronous condenser determined by integrating a set of nonlinear differential equations; specifically, the Kuybyshev-Moscow line; (4) determining the aerodynamic

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SOV/112-59-2-3461

Use of Electron Computers for Engineering Calculations

characteristics of profiles and solids of revolution in a subsonic air stream, using the method of integral relations; (5) calculating the terrain maps by the iteration method. The need for specialized computers in solving this type of problem is noted.

Yu. M. Shch.

Card 2/2

AUTHOR: Shmyglevskiy, Yu.D. (Moscow) 40-22-2-18/21

TITLE: On Supersonic Profiles Possessing a Minimum Resistance (O sverkhzvukovykh profilyakh, imeyushchikh minimal'noye soprotivleniye)

PERIODICAL: Prikladnaya matematika i mekhanika, 1958, Vol 22, Nr 2, pp 269-273 (USSR)

ABSTRACT: For a profile in supersonic flow of a gas that form is sought for which the impact wave resistance is a minimum. It is assumed, that there exists a uniform gas flow with a velocity constant at infinity in parallel with the X-axis. Furthermore there are assumed two points A and B through which the sought profile is to pass. The point A is to be the starting point of the profile from which a shock wave originates which in certain cases may degenerate into a characteristic of the flowing gas. After setting up the integral formulas for the forces acting on the profile, the problem is formulated as a variational problem. For the solution the method of the Lagrange multiplier is applied.

The numerical evaluation shows that the profile which possesses a minimum impact wave resistance in the present cases is practically identical with a wedge. The profile consists of two

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On Supersonic Profiles Possessing a Minimum Resistance

40-22-2-18/21

rectilinear parts to which a relatively small curvilinear part is attached. The results of the evaluation are represented in two tables and several diagrams. There are 4 figures, 2 tables, and 2 Soviet references.

SUBMITTED: September 23, 1957

1. Gas flow--Mathematical analysis 2. Supersonic flow--Mathematical analysis

Card 2/2

SHMYGLEVSKIY, Yu.D.

Using electronic calculating machines in engineering calculations.
[Izd.] LONITOMASH 44:19-26 '58. (MIRA 11:9)
(Electronic calculating machines) (Engineering)

IC(7)
AUTHOR:

Shaydlovskiy, Yu. D.

SOV/20-122-5-9/56

TITLE:

On Some Properties of the Axially-Symmetric Supersonic
Flows of a Gas (O nekotorykh svoystvakh osesimmetrichnykh
svyazkhnulykh techeniy gaza)

PERIODICAL:

Doklady Akademi nauk SSSR, 1956, Vol 122, Nr 5,
p. 702 - 704 (USSR)

ABSTRACT:

The present paper investigates the axially-symmetric
supersonic flows of a gas, which are determined by
an assumed characteristic of the first family AC and by the
generatrix AB of the body of rotation round which
the flow takes place. Such gas flows satisfy a
canonical system of equations which is given here.
Also for the flow function a relation is written down.
A short report is made on the course of calculation
and on some boundary conditions. Finally, the following
conclusions remain to be drawn: 1) In an axially-
symmetric supersonic flow round a body of rotation
the increase of the radius of curvature R of the

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On Some Properties of the Axially-Symmetric Supersonic Flows of a Gas SOV/20-122-5-9/56

Generatrix AB of this body at the point A leads to a decrease of the derivatives da/ds and $d\varphi/ds$ on an assumed characteristic AC. The signs have here already been taken into account. α denotes the Mach (Mach) angle and φ the angle of inclination of velocity with respect to the axis of the flow. 2) In an axially-symmetric supersonic flow of a body of rotation the increase of the radius of curvature R of the generatrix AB of the body of rotation at the point A causes an increase of the radius of curvature R_b of the line of the shock wave CE at the point C if A and C are connected with each other by a characteristic of the first family. There are 1 figure and 1 Soviet reference.

ASSOCIATION: Vychislitel'nyy tsentr Akademii nauk SSSR (Computation Center of the Academy of Sciences USSR)

Card 2/3

16(1), 16(2)

Leonidov, L.S., and Zakova, E.S.

30V/42-14-1-27/27

27

TITLE: New Publications on Applied Analysis and Numerical Mathematics
(Novyye izdaniya po prikladnomu analizu i vychislitel'noy matematike)

ABSTRACT: It is stated that in the USSR there exists no periodical on numerical mathematics and analysis devoted to the publication of these and other mathematical results. Publications on applied Analysis and Numerical Mathematics (ANM) and in single collected volumes. The series ANM began in 1955 and until now it contained the following monographs: 1. G.S. Salakhov "Calculation of Series"; 2. A.M. Zhovanskii "Application of Continued Fractions in the Approximate Analysis"; 3. V.S. Praben'kiy, A.P. Filippov "Stability of Difference Equations"; 4. A.G. Zhukovskiy "Non-linear"; 5. M. Mikol'skiy "Quadratic Formulas"; 6. V. V. Vozhakov "Arithmetic Derivatives of Algebraic Functions"; 7. V. V. Vozhakov, G.S. Rozhnakov, N.P. Trifonov, M.R. Shura-Bura "System of Standard Subroutines".

[illegible]

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67-09-08-0000

SOV/20-126-5-12/69

10 (2)
AUTHOR:

Shmyglevskiy, Yu. D.

TITLE:

On Bodies of Rotation Having Minimum Resistance at Supersonic Velocities (O telakh vrashcheniya, imeyushchikh minimal'noye soprotivleniye na sverkhzvukovykh skorostyakh)

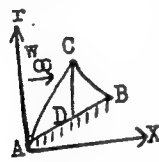
PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 5, pp 958 - 960 (USSR)

ABSTRACT:

The following problem is set: The velocity w_∞ of the gas flow striking contour AB and points A and B is given. The author investigates the case in which a shock wave AC appears in addition; BC is assumed to be the characteristic of the second type and CD that of the first type. The problem is dealt with according to reference 1. The search for contour AB of the rotation body with minimum resistance can now be regarded as a problem of variation.

The constants $w_\infty, r_A, r_B, X=x_B-x_A$ are given and the function $\sigma(\psi)$ is desired, which realizes the extreme value of χ . χ is given by



$$\chi = \int_{\psi=\psi_A}^{\psi_C} \left\{ \frac{x-1}{2x} \left(w_\infty + \frac{1}{w_\infty} \right) - a(\alpha) \left[\cos \psi - \frac{1}{x} \sin \alpha \sin(\psi - \alpha) \right] \right\} d\psi$$

Card 1/2

KATSKOVA, Ol'ga Nikiforovna; SHMYGLEVSKIY, Yu.D., otv.red.; YAKOVKIN,
M.V., red.; KORKINA, A.I., tekhn.red.

[Description of the programming system of the BESM-1 computer]
Opisanie sistemy komand elektronnoi vychislitel'noi mashiny
BESM-I. Moskva, Vychislitel'nyi tsentr AN SSSR, 1960. 70 p.
(MIRA 14:1)

(Electronic digital computers)
(Programming (Electronic computers))

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C111/C222

AUTHOR: Shmyglevskiy, Yu.D. (Moscow)

TITLE: On a Class of Bodies of Rotation With a Minimal Wave Resistance

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol.24, No.5,
pp.923-926

TEXT: The author seeks the generating line AB (figure 1) of a body of

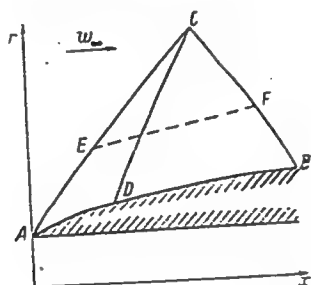


Fig. 1

rotation for which, for given w_∞ , r_A and r_B the wave resistance is

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On a Class of Bodies of Rotation With a Minimal Wave Resistance

minimal. It is assumed that the shock wave AC is an adjoint one; BC is the characteristic line of the second family, CD is the characteristic line of the first family. It is shown that the determination of AB leads to a variation problem which in general has no classical solution. The

classical solution exists only if $w_\infty, \frac{r_A}{X}, \frac{r_B}{X}$, where $X = x_B - x_A$, satisfy very special relations (cf. (Ref.4)). The figure 3 shows for several Mach numbers the results of the calculation of some possible cases (body 1,2,3,4).

The table shows the resistance coefficients c_x with respect to the surface πr_B^2 .

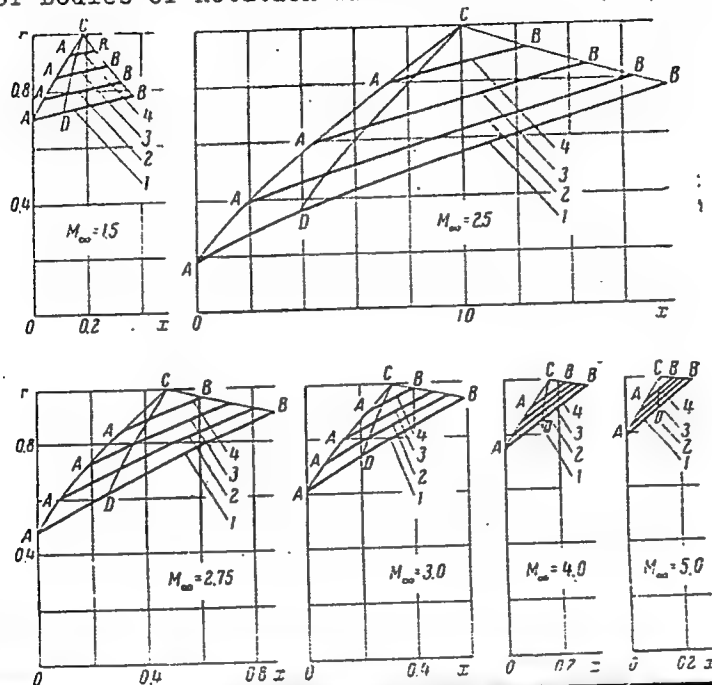
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On a Class of Bodies of Rotation With a Minimal Wave Resistance



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On a Class of Bodies of Rotation With a Minimal Wave Resistance

table

M_∞	body	$r_A:X$	$r_B:X$	c_x	M_∞	body	$r_A:X$	$r_B:X$	c_x
1.5	1	1.8796	2.0895	0.0818	3.0	1	1.0377	1.6009	0.3990
	2	2.7412	2.9387	0.0547		2	1.5157	2.0485	0.3022
	3	4.4709	4.6579	0.0325		3	2.4721	2.9805	0.2035
	4	9.6699	9.8478	0.0146		4	5.3340	5.8215	0.1026
2.5	1	0.1121	0.4433	0.2495	4.0	1	2.5188	3.2635	0.3907
	2	0.2762	0.5590	0.1934		2	3.1935	3.9190	0.3191
	3	0.5904	0.8406	0.1267		3	4.2947	5.0035	0.2463
	4	1.5492	1.7754	0.0587		4	6.3790	7.0727	0.1722
2.75	1	0.5531	1.0371	0.3881	5.0	1	3.3457	4.1783	0.3864
	2	0.8370	1.2872	0.3029		2	4.2531	5.0674	0.3135
	3	1.4257	1.8275	0.2067		3	5.7681	6.5663	0.2391
	4	3.0888	3.4871	0.1078		4	8.7588	9.5422	0.1629

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On a Class of Bodies of Rotation With a Minimal Wave Resistance

The author mentions S.N.Yelisegev and B.M.Kiselov. He thanks L.V. Papandina for the programming. There are 3 figures, 1 table and 4 Soviet references.

[Abstracter's note: (Ref.4) is a paper of the author in Prikladnaya matematika i mekhanka, 1958, Vol.22, No.2]

SUBMITTED: June 16, 1960

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Card 5/5

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26.5200

AUTHORS: Iordanskiy, S.V., and Shmygilevskiy, Yu.D. (Moscow)

TITLE: Sublimation of an axially symmetric blunt body near the stagnation point of incident gas flow

PERIODICAL: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk. Inzhenernyy sbornik, v. 28, 1960, 26 - 35

TEXT: The authors obtain here the equations of an axially symmetric laminar boundary layer for a 2-component gas at low temperatures with diffusion present. Boundary conditions are derived for the case of sublimation, and the method is given for calculating sublimation flow and velocity near the stagnation point. Finally solid CO₂ in the stream of air is considered as an example. According to L.D. Landau and Ye.M. Livshits (Ref. 2: Mekhanika sploshnykh sred (Mechanics of Continuous Media) Gostekhizdat, M. 1954) the flow of multi-component gas is described by

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Sublimation of an axially ...

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$$\left. \begin{aligned} \frac{\partial \rho w_i}{\partial x_i} &= 0, \\ \frac{\partial \rho c_\alpha w_i}{\partial x_i} + \frac{\partial l_{i\alpha}}{\partial x_i} &= 0, \\ \rho w_k \frac{\partial w_i}{\partial x_k} &= - \frac{\partial p}{\partial x_i} + \frac{\partial \sigma_{ik}}{\partial x_k}, \end{aligned} \right\} \quad (1.1)$$

$$\frac{\partial}{\partial x_i} \left[\rho \left(\frac{w^2}{2} + h \right) w_i - w_k \sigma_{ik} + q_i \right] = 0, \quad (1.2)$$

$$\rho = \rho(p, T, c_1, c_2, \dots).$$

$$j_{i\alpha} = - \rho D_\alpha \left(\frac{\partial c_\alpha}{\partial x_i} + \frac{k_T^{(\alpha)}}{T} \frac{\partial T}{\partial x_i} + \frac{k_p^{(\alpha)}}{p} \frac{\partial p}{\partial x_i} \right), \quad (1.3)$$

$$q_i = [k_T^{(\alpha)} M_\alpha - T M'_\alpha + \mu_\alpha] j_{i\alpha} - \kappa \frac{\partial T}{\partial x_i},$$

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$$\sigma_{ik} = \eta \left(\frac{\partial w_1}{\partial x_k} + \frac{\partial w_k}{\partial x_1} - \frac{2}{3} \delta_{ik} \frac{\partial w_l}{\partial x_l} \right) + \zeta \delta_{ik} \frac{\partial w_l}{\partial x_l}; \quad (1.3)$$

For two-component gas (1.1) and (1.3) are transformed into cylindrical coordinates by $x_1 = x$, $x_2 = x \cos \vartheta$, $x_3 = x \sin \vartheta$ and the equations of axial flow in (x, r) plane are derived in an (s, n) orthogonal coordinate system associated with the surface AB of the body (Fig. 1). The partials are then

$$\frac{\partial}{\partial x} = \frac{R \cos \gamma}{R + n} \frac{\partial}{\partial s} - \sin \gamma \frac{\partial}{\partial n}, \quad \frac{\partial}{\partial r} = \frac{R \sin \gamma}{R + n} \frac{\partial}{\partial s} + \cos \gamma \frac{\partial}{\partial n},$$

where R = radius of curvature, γ = angle between tangent to AB and x -axis at the given point. Tangential and normal velocities u and v are given by

$$w_r = u \sin \gamma + v \cos \gamma, \quad w_x = u \cos \gamma - v \sin \gamma.$$

Then for a small velocity of sublimation

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$$\left. \begin{aligned} \frac{\partial r \rho u}{\partial s} + \frac{\partial r \rho v}{\partial n} &= 0, \\ \rho u \frac{\partial c}{\partial s} + \rho v \frac{\partial c}{\partial n} &= \frac{\partial}{\partial n} \rho D \left(\frac{\partial c}{\partial n} + \frac{k_T}{T} \frac{\partial T}{\partial n} \right), \\ \rho u \frac{\partial u}{\partial s} + \rho v \frac{\partial u}{\partial n} &= -\frac{dp}{ds} + \frac{\partial}{\partial n} \eta \frac{\partial u}{\partial n}, \\ \frac{\partial p}{\partial n} &= 0 \text{ или } p = p(s), \\ \rho u \frac{\partial}{\partial s} \left(h + \frac{u^2}{2} \right) + \rho v \frac{\partial}{\partial n} \left(h + \frac{u^2}{2} \right) &= \frac{\partial}{\partial n} \left\{ \eta \frac{\partial}{\partial n} \frac{u^2}{2} + \right. \\ &\left. + \kappa \frac{\partial T}{\partial n} + \rho D (h_\alpha - h_\beta + k_T M) \left(\frac{\partial c}{\partial n} + \frac{k_T}{T} \frac{\partial T}{\partial n} \right) \right\}, \end{aligned} \right\} \quad (1.4)$$

is obtained, where $M = M_\alpha + M_\beta$. For low temperature work in the absence of chemical reactions,

$$p = mR \left(\frac{c}{m_\alpha} + \frac{1-c}{m_\beta} \right) \rho T, \quad h = c h_\alpha + (1-c) h_\beta,$$

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can be utilized, where c is independent of α and T . Boundary conditions when gas α flows around a body β are for $\lambda = \infty$,

$$f_{\lambda}(\xi, \infty) = 1 \quad (2.1), \quad T(\xi, \infty) = T_e(\xi), \quad c(\xi, \infty) = c_e(\xi), \quad (2.2)$$

where $T_e(\xi)$ and $c_e(\xi)$ are the temperature and concentration of α and for $\lambda = 0$

$$f_{\lambda}(\xi, 0) = 0 \quad (2.3), \quad T(\xi, 0) = T_w(p_e(\xi)) \quad (2.9)$$

and

$$\left. \begin{aligned} & \left[(2\xi f_{\xi} + f)c + \frac{L}{P} \left(c_{\lambda} + \frac{h_T}{T} T_{\lambda} \right) \right]_{\lambda=0} = 0, \\ & \left[(2\xi f_{\xi} + f)(Q - ck_T M) + \frac{c_p}{P} T_{\lambda} \right]_{\lambda=0} = \frac{q_T \sqrt{2\xi}}{ru_{\theta} \omega \eta_w} \end{aligned} \right\} \quad (2.11)$$

where $Q = [h_{\beta}(T_w)]_{+0} - [h_{\beta}(T_w)]_{-0}$ = heat of sublimation of unit mass of β at the temperature T_w . Flow near the axis of symmetry is

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solved where the solution can be expressed in the form of a power series in $\sqrt{\xi}$ with coefficients dependent on λ , if $p_e(\xi)$ can also be expanded in powers of $\sqrt{\xi}$. Terms independent of ξ will then give a solution on the axis of symmetry. In dimensionless magnitudes

$$t = \frac{T}{T_w|_{\xi=0}}, \quad H = \frac{m_a(h_a - h_b)}{mRT_w|_{\xi=0}}, \quad \gamma = \frac{m_a c_p}{mR},$$

$$\Phi = l f_\lambda, \quad F = f_\lambda, \quad K = \frac{Ll}{p} \left(c_\lambda + \frac{k_r}{T} T_\lambda \right)$$

$$E = \frac{l\gamma}{p} t_\lambda + K(H + k_r M).$$

$$\Phi_\lambda = -f \frac{\Phi}{T} - \frac{1}{2} \left(\frac{p_s}{p} - F^2 \right),$$

$$F_\lambda = \frac{\Phi}{T}, \quad f_\lambda = F,$$

(3.1)

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$$\begin{aligned} t_\lambda &= \frac{P}{l_\gamma} \left\{ E - K \left[H + k_r \frac{m_p(1-q) + m_s q}{m_p q(1-q)} t \right] \right\}, \\ c_\lambda &= \frac{PK}{Li} - \frac{k_r}{l} t_\lambda, \quad K_\lambda = -f c_\lambda, \\ E_\lambda &= -f(H c_\lambda + \gamma t_\lambda). \end{aligned} \quad (3.1)$$

is obtained and the boundary conditions (2.1)-(2.3), (2.9) and (2.11) become

$$\left. \begin{aligned} F(0) &= 0, \quad t(0) = 1, \quad K(0) = -f(0)c(0), \\ E(0) &= -f(0)[\bar{Q} + H(0)c(0)], \\ F(\infty) &= 1, \quad t_\infty = \frac{T_e}{T_w}, \quad c(\infty) = 1, \end{aligned} \right\} \quad (3.2)$$

where $\bar{Q} = \frac{m_\alpha Q}{mRT_w} \Big|_{\xi=0}, \quad Q = \frac{mRT_w^2}{p_e} \frac{dp_e}{dT_w}.$

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For flow without diffusion (3.1) can be used if its 5th and 6th equations are replaced by

$$K(\lambda) = 0, c = \begin{cases} 0 & \text{when } f < 0, \\ 1 & \text{when } f > 0, \end{cases}$$

and for the flow without sublimation (3.1) can be used with the boundary conditions

$$F(0) = 0, t(0) = 1, f(0) = 0, c(0) = 1,$$

$$F(\infty) = 1, t(\infty) = T_e/T_w, c(\infty) = 1,$$

where T_w = given temperature. The problem of the flow of air $M = 6.2$ around the body composed of solid CO_2 is solved as an example. There are 3 figures and 11 references: 3 Soviet-bloc and 8 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: J.A. Fay, R.F. Riddell, Theory of Stagnation Point Heat Transfer in Dissociated Air, J. Aeron. Sci. vol. 25, No. 2, 1958; Tables of Thermal Properties of Gases, US Department of Commerce National Bureau of Standards, Circular 564

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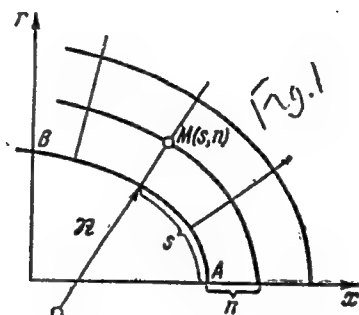
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Fig. 1.



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Computation Practice of Horizontal (Cont.) SOV/5608

Center of the Academy of Sciences USSR) has been deriving experience from the use of this method since 1955. The authors thank P. I. Chushkin. There are 11 references: 8 Soviet, 1 English, 1 French, and 1 German.

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CHUSHKIN, P.I.; SHULISHNINA, N.P.; SHAYGLEVSKIY, Yu.D., otv. red.;
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[Tables for supersonic flow around blunt-nosed cones] Tab-
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(Aerodynamics, Supersonic--Tables, etc.)

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TITLE:

Anatoliy Alekseyevich Dorodnitsyn (on the occasion of
his 50th birthday

PERIODICAL:

Uspekhi matematicheskikh nauk, v. 16, no. 2, 1961,
189-196

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C 111/ C 222

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